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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/528,379	03/17/2000	John W. Gillespie JR.	131*182	4271

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[REDACTED] EXAMINER

BARAN, MARY C

ART UNIT	PAPER NUMBER
2857	

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Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

<b>Application No.</b>  <b>Examiner</b>  <b>Mary Kate B Baran</b>	<b>Application No.</b>	<b>Applicant(s)</b>
	09/528,379	GILLESPIE ET AL.

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) Responsive to communication(s) filed on 03 July 2000.
- 2a) This action is FINAL.                    2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) Claim(s) 1-15 is/are pending in the application.
  - 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) Claim(s) \_\_\_\_\_ is/are allowed.
- 6) Claim(s) 1-15 is/are rejected.
- 7) Claim(s) \_\_\_\_\_ is/are objected to.
- 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on 17 March 2000 is/are: a) accepted or b) objected to by the Examiner.
 

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) The proposed drawing correction filed on \_\_\_\_\_ is: a) approved b) disapproved by the Examiner.
 

If approved, corrected drawings are required in reply to this Office action.
- 12) The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. §§ 119 and 120

- 13) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) All b) Some \* c) None of:
    1. Certified copies of the priority documents have been received.
    2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.
- 14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
  - a) The translation of the foreign language provisional application has been received.
- 15) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                           | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____  |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2 . | 6) <input type="checkbox"/> Other: _____                                    |

## **DETAILED ACTION**

### ***Drawings***

1. The drawings are objected to because:

(a) Figures 3-6 have hand-drawn graphical lines that are difficult to see.

(b) The specification makes reference to a Figure 8, page 8 line 7, however a Figure 8 has not been supplied.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

### ***Specification***

2. The abstract of the disclosure is objected to because, the abstract exceeds 150 words. Correction is required. See MPEP § 608.01(b).

### ***Claim Objections***

3. Claims 1 and 9 are objected to because of the following informalities:
    - (a) In claim 1, line 9, and claim 9 line 14, "the piezoelectric actuator" lacks proper antecedent basis.
    - (b) Claim 1, page 10 line 9, the term "inputs" should be – input – and the term "signal" should be – signals –.
    - (c) Claim 9, page 12 line 6, the phrase "from matrix" should be –from the matrix–.
- Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

4. Claims 5 and 13 are rejected under 35 USC 112 fourth paragraph, as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. The limitation "piezoelectric actuator" has already been recited in claim 1 and claim 9.

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-8 rejected under 35 U.S.C. 103(a) as being unpatentable over Bache (U.S. Patent No. 4,979,992) in view of Owen et al. (U.S. Patent No. 6,023,980) (hereinafter Owen).

Referring to claim 1, Bache teaches a dynamic interphase-loading apparatus (DILA) for testing the mechanical properties of an interphase region of a fiber/matrix composite (see Bache, column 20 lines 28-29) under quasi-static (see Bache, column 19 lines 27-34) to dynamic (see Bache, column 76 lines 39-46) (high strain rate and fatigue) loading conditions, the apparatus comprising: means for providing a quasi-static to dynamic load to the fiber/matrix interphase (see Bache, column 68 lines 26-32); means for continuously monitoring the load applied to the fiber/matrix composite and

providing a signal representative thereof (see Bache, column 68 lines 26-40); means for continuously monitoring the displacement of the interphase of the fiber/matrix composite and providing a signal representative thereof (see Bache, column 61 lines 20-28); and generating information representing the mechanical properties of the interphase of the fiber/matrix composite (see Bache, column 61 lines 20-45).

Bache does not teach means for forming various input signals to activate the piezoelectric actuator and to generate various displacement rates; or a computing means for receiving the load signal from the load monitoring means, for receiving the displacement signal from the displacement monitoring means, and for providing an input signal to the piezoelectric actuator, the computing means having a memory means connected to a processing means, wherein the processing means stores the load signal in the memory means, and generates the input signal supplied to the piezoelectric actuator.

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Owen teaches means for forming various input signals to activate a piezoelectric actuator and to generate various displacement rates (see Owen, column 3 line 63 – column 4 line 6); and a computing means for receiving the load signal from the load monitoring means (see Owen, column 8 lines 1-5), for receiving the displacement signal from the displacement monitoring means, and for providing an input signal to the piezoelectric actuator (see Owen, column 8 lines 10-30), the computing means having a memory means connected to a processing means, wherein the processing means stores the load signal in the memory means (see Owen, column 8 lines 1-5), and

generates the input signal supplied to the piezoelectric actuator (see Owen, column 8 lines 56-67).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Bache to include the teachings of Owen, because using a computer to generate signals would have allowed the skilled artisan to independently control the static and dynamic loading (see Owen, column 7 lines 53-57), using the computer to record test results would have allowed the skilled artisan to process the data (see Owen, column 9 lines 8-14) and using a piezoelectric actuator would have allowed the skilled artisan to track changes in temperature or other physical properties (see Owen, column 8 lines 40-44).

Referring to claim 2, Bache discloses information representing the mechanical properties generated by the computing means comprising the interfacial shear strength (see Bache, column 71 lines 8-26), frictional sliding stress (see Bache, column 26 lines 54-64), energy absorbing capability (see Bache, column 24 lines 8-14), and stress-strain response (see Bache, column 40 lines 62-67) of the interphase of the fiber/matrix composite (see Bache, column 41 lines 29-38).

Referring to claim 3, Bache teaches computing means that generate information representing the durability of the interphase of the fiber/matrix composite (see Bache, column 16 lines 57-63).

Referring to claim 4, Bache discloses information representing the durability of the interphase of the fiber/matrix composite (see Bache, column 16 lines 57-63) comprising the fatigue life (see Bache, column 78 lines 17-20) and the residual strength after fatigue loading (see Bache, column 78 lines 30-34) or exposure to a hygrothermal environment of the interphase of the fiber/matrix composite (see Bache, column 54 lines 26-28).

Referring to claim 5, Bache teaches all the features of the claimed invention except for load providing means comprising a piezoelectric actuator.

Owen teaches load providing means comprising a piezoelectric actuator (see Owen, column 8 lines 53-55).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Bache to include the teachings of Owen, because a piezoelectric actuator allows the skilled artisan to track changes in temperature or other physical properties (see Owen, column 8 lines 40-44).

Referring to claim 6, Bache discloses a displacement monitoring means comprising a strain gauge bridge (see Bache, column 19 lines 9-34).

Referring to claim 7, Bache teaches all the features of the claimed invention except for a load monitoring means comprising a load cell.

Owen teaches a load monitoring means comprising a load cell (see Owen, column 10 lines 62-64).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Bache to include the teachings of Owen, because a load cell allows the skilled artisan to measure the applied static load (see Owen, column 10 lines 62-64).

Referring to claim 8, Bache teaches all the features of the claimed invention except for a means for forming various input signals comprising a waveform generator.

Owen discloses a means for forming various input signals comprises a waveform generator (see Owen, column 8 lines 31-44).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Bache to include the teachings of Owen, because using a waveform generator to form input signals allows the skilled artisan to create inputs independent of the machine resonance frequency (see Owen, column 8 lines 36-40).

6. Claims 9-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bache (U.S. Patent No. 4,979,992) in view Owen et al. (U.S. Patent No. 6,023,980) (hereinafter Owen) and further in view of Tse (U.S. Patent No. 4,662,228).

Referring to claim 9, Bache teaches a method for testing the mechanical properties of an interphase region of a fiber/matrix composite (see Bache, column 20 lines 28-29) under quasi-static (see Bache, column 19 lines 27-34) to dynamic loading

conditions (see Bache, column 76 lines 39-46), the method comprising the steps of: providing a quasi-static to dynamic load to the fiber/matrix interphase (see Bache, column 68 lines 26-32); continuously monitoring the load applied to the fiber/matrix composite and providing a signal representative thereof (see Bache, column 61 lines 20-28); and continuously monitoring the displacement of the interphase of the fiber/matrix composite and providing a signal representative thereof (see Bache, column 61 lines 20-28).

Bache does not teach using a diamond tip as a probe to load the interphase; debonding the fiber from the matrix at the interphase region and eventually pushing the fiber out from the matrix; receiving the load signal and the displacement signals in a computing means having a memory means connected to a processing means; providing a control signal to the piezoelectric actuator, via the computing means; or using the processing means of the computing means to store the load signal in the memory means, generate the control signal supplied to the piezoelectric actuator, and generate information representing the mechanical properties of the interphase of the fiber/matrix composite.

Owen teaches receiving the load signal and the displacement signals in a computing means having a memory means connected to a processing means (see Owen, column 8 lines 1-5); providing a control signal to the piezoelectric actuator, via the computing means (see Owen, column 8 lines 10-30); and using the processing means of the computing means to store the load signal in the memory means (see Owen, column 8 lines 1-5), generate the control signal supplied to the piezoelectric

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actuator (see Owen, column 8 lines 56-67), and generate information representing the mechanical properties of the interphase of the fiber/matrix composite (see Owen, column 10 lines 2-10).

Tse teaches using a diamond tip (see Tse, column 5 lines 26-36) as a probe to load the interphase (see Tse, column 6 lines 6-10), and debonding the fiber from the matrix at the interphase region and eventually pushing the fiber out from the matrix (see Tse, column 6 lines 6-10).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Bache to include the teachings of Owen because using a computer to generate signals allows the skilled artisan to independently control the static and dynamic loading (see Owen, column 7 lines 53-57), further using the computer to record test results allows the skilled artisan to process the data (see Owen, column 9 lines 8-14) and using a piezoelectric actuator allows the skilled artisan to track changes in temperature or other physical properties (see Owen, column 8 lines 40-44). It would have been further obvious to modify Bache and Owen to include the teachings of Tse, because using a diamond tip as a probe allows the skilled artisan to make the probe small and hard enough to break the bond between the fiber and the polymer (see Tse, column 5 line 61 – column 6 line 10), and debonding the fiber from the matrix allows the skilled artisan to measure the load changes (see Tse, column 6 lines 6-10).

Referring to claim 10, Bache discloses information representing the mechanical properties generated by the computing means comprising the interfacial shear strength

(see Bache, column 71 lines 8-26), frictional sliding stress (see Bache, column 26 lines 54-64), energy absorbing capability (see Bache, column 24 lines 8-14), and stress-strain response (see Bache, column 40 lines 62-67) of the interphase of the fiber/matrix composite (see Bache, column 41 lines 29-38).

Referring to claim 11, Bache teaches using the processing means of the computing means to generate information representing the durability of the interphase of the fiber/matrix composite (see Bache, column 16 lines 57-63).

Referring to claim 12, Bache discloses information representing the durability of the interphase of the fiber/matrix composite (see Bache, column 16 lines 57-63) comprising the fatigue life (see Bache, column 78 lines 17-20) and the residual strength after fatigue loading (see Bache, column 78 lines 30-34) or exposure to a hygrothermal environment of the interphase of the fiber/matrix composite (see Bache, column 54 lines 26-28).

Referring to claim 13, Bache and Tse teach all the features of the claimed invention except that the quasi-static to dynamic load provided to the fiber/matrix interphase is provided by a piezoelectric actuator.

Owen teaches that the quasi-static to dynamic load provided to the fiber/matrix interphase is provided by a piezoelectric actuator.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Bache and Tse to include the teachings of Owen, because a piezoelectric actuator allows the skilled artisan to track changes in temperature or other physical properties (see Owen, column 8 lines 40-44).

Referring to claim 14, Bache teaches that the displacement of the interphase is monitored with a strain gauge bridge (see Bache, column 19 lines 9-34).

Referring to claim 15, Bache and Tse teach all the features of the claimed invention except that the load applied to the interphase is monitored with a load cell.

Owen teaches that the load applied to the interphase is monitored with a load cell (see Owen, column 10 lines 62-64).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Bache and Tse to include the teachings of Owen, because the use of a load cell allows the skilled artisan to measure the applied static load (see Owen, column 10 lines 62-64).

### ***Conclusion***

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

(a) Gerardi et al. teaches a method and apparatus for structural integrity monitoring.

- (b) Mueller et al. teaches elastomer coated fillers and composites thereof comprising at least 60% by wt. of a hydrated filler and an elastomer containing an acid substituent.
- (c) Gibson et al. teaches an apparatus and process for measuring mechanical properties of fibers.
- (d) Monette et al. teaches components with interphases and methods of making same.
- (e) Chung teaches a composite material stress/strain sensor.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mary Kate B Baran whose telephone number is (703) 305-4474. The examiner can normally be reached on Monday - Friday from 8:00 am to 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Marc S Hoff can be reached on (703) 308-1677. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-1782.

MKB  
March 10, 2003

  
MARC S. HOFF  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800